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NASA Connecticut Space Grant Consortium

NEWSLETTER

Our Mission: to establish and promote NASA-related research opportunities, support education initiatives that inspire students, and to promote workforce development.

Broadcasting for Rare Total Solar Eclipse

On August 21, 2017 a rare astronomical event—a total solar eclipse—will be visible throughout portions of the United States as members of the NASA CTSGC participate in an unprecedented national public outreach project. Along with 54 other student groups at 25 locations from Oregon to South Carolina, a Connecticut team will launch a high altitude balloon and provide live eclipse video and images to NASA's website from near space (an altitude of approximately 100,000 feet).

The Connecticut team is composed of students and faculty from University of Bridgeport, University of Hartford, the Physical Sciences, Engineering, and Aerospace/Hydrospace Science High School of the Fairchild Wheeler Campus, and high altitude ballooning mentors from the Discovery Museum and Planetarium in Bridgeport.

The 54 teams will have a national practice on June 20, 2017. Since the total eclipse will not be visible from Connecticut, the team will travel and be hosted by the University of Kentucky. The team will launch near the eclipse path in Cadiz, Kentucky.

"We've been preparing for this for two years, developing our ballooning capabilities and expertise in high altitude instrumentation, cameras, mission operations, communications and recovery. There are a lot challenges and logistics to be orchestrated and practiced," said project coordinator Dr. Jani Macari Pallis from the University of Bridgeport.

One of those challenges will be to assure that the video and still camera systems point at the eclipse. The balloons often spin around and the cameras need to remain pointed at the eclipse to broadcast.

A total solar eclipse occurs when the moon moves between the Earth and the Sun and the darkest part of the moon's shadow (the umbra) is projected onto the Earth. While video and images of a total eclipse from near space were taken once before in Australia in 2012, this has never been done live and utilizing a network of groups of students across a continent.

Dr. Hisham Alnajjar, Director of the NASA CTSGC, said, "We have planned for this exciting project and are pleased to be part of this national collaboration with NASA, Montana Space Grant, and other state Space Grant consortia organizations. The project supports the NASA CTSGC mission to collaborate between private, academic and government sectors, support educational initiatives to inspire students to pursue science, technology, engineering, and mathematics (STEM), and promote Connecticut workforce development."

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STUDENT SPOTLIGHT:

Caitlin Hansen

In the Fall of 2015, Caitlin Hansen was awarded an Undergraduate Research Fellowship from NASA CTSGC to proceed with an image processing study titled "Determination of Nanoparticle Size Distributions to Investigate Sameness." This study served as a continuation of her Honor's Thesis through the physics department at Southern Connecticut State University.

The study began as a general statistical analysis of big data using pharmaceutical nanoparticle size measurements as a model system. Nanoparticle size analysis is an area of concern for numerous industries and organizations, like NASA, because the physical properties of materials often change as size is reduced from bulk to nanoscale. Therefore, accurate particle size distributions are a necessity when investigating the unique and often unanticipated properties of nanoparticles. This study assessed the bioequivalence of nanoparticles synthesized through two different methods by pharmaceutical companies. Morphology measurements were made on transmission electron microscope (TEM) images using hand-drawn ellipses as representative particle shapes. Upon statistical analysis, it was determined that this hand-drawing method introduced too much error to the particle size measurements for accurate comparison of the two synthesis methods.

Caitlin Hansen (left) and Dr. Mohd Hossain (right)

A Java macro was developed with ImageJ, an open-source Java-based image processing program, to automate and standardize the particle size measurements (Figure 1). Various image processing techniques were investigated to determine the optimal method of removing TEM camera artifacts and reducing background noise (Figure 1.A). Image segmentation was then applied to the processed TEM images to cluster pixels into salient image regions for identification of particles from the background (Figure 1.B). The segmented images were converted to binary for automated predictive size measurements (Figure 1.C). The determination of particle edge was standardized throughout all TEM images when using the macro, eliminating the human error from the previous method of measuring particle sizes by hand. Furthermore, entire batches of TEM images were able to be processed, allowing for collection of larger sample sizes. Overlaying the automated particle identification images on the original TEM images supports the capabilities of the macro to collect measurements from TEM images of various contrast levels and focus (Figure 2). Overall, the developed Java macro for particle prediction allowed for easier comparison of the two synthesis methods.

This fellowship allowed Caitlin to unite her physics background with her interests in statistics, data analysis, and algorithm development. With her newly developed skills, Caitlin recently accepted a job offer at Pratt & Whitney as a Business Data Analyst. She plans to gain experience working in industry and to pursue a higher-level education through graduate school in the near future.

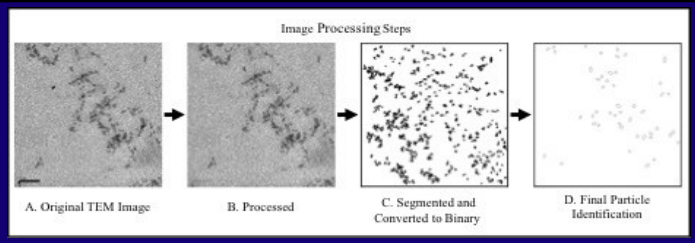

Figure 1: Representative nanoparticle TEM image showing results for each processing step

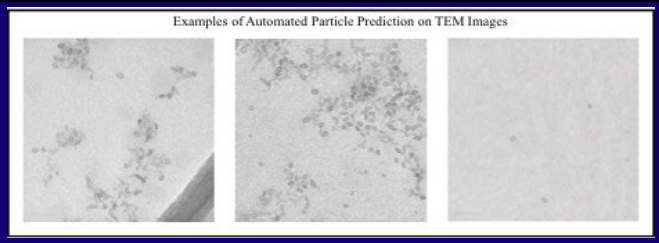

Figure 2: Representative TEM images with the automated particle predictions overlaid on the original TEM images

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OUT OF THIS WORLD!

This fall, over 300 students at Two Rivers Magnet Middle School took part in the "Student Spaceflight Experiments Program" (SSEP), partially funded through NASA CTSGC. Of those 300+ students, a single group of five took the top honor of securing a spot on the M11 *America* Payload to the International Space Station. Their experiment is set to launch from Cape Canaveral Air Force Station in August of 2017. Eighth graders Kassidy Gagnon of East Hartford, Jack McCann of Vernon, Andrew Niemczyk of Vernon, Angel Soto of East Hartford, and Kieran Yanaway of South Windsor designed and proposed an experiment that addresses the question: "*How does microgravity affect algae growth?*"

The students came up with the idea and preliminary design, and found a mentor in Dr. Martin Gross, a Post-Doctoral Research Associate at Iowa State University who specializes in algae production and research. Dr. Gross and the students have corresponded with each other with regards to design and data analysis of their mini- lab upon its return to Earth. In addition to the experiment running at the International Space Station, the students will run an identical ground truth experiment at school, and will compare the two mini-labs in terms of algae growth at the conclusion of the space flight.

SSEP is a program of the National Center for Earth and Space Science Education in the U.S. and the Arthur C. Clarke Institute for Space Education internationally. It is enabled through a strategic partnership with DreamUp PBC and NanoRacks LLC, which are working with NASA under a Space Act Agreement as part of the utilization of the International Space Station as a National Laboratory. SSEP is the first pre-college STEM education program that is both a U.S. national initiative and implemented as an on-orbit commercial space venture.

8th grade student scientists participating in M11: K. Gagnon, J. McCann, A. Niemczyk, A. Soto, and K. Yanaway

NGSS Teacher Workshops

Bridgeport and Hartford

NGSS hosted at the Discovery Museum and Planetarium in Bridgeport, CT

Professors Ryan McCulloch (Mathematics), Nancy DeJarnette (Education) and Jani Pallis (Engineering) from the University of Bridgeport developed and facilitated a Next Generation Science Standards (NGSS) K-12 Engineering Design and Earth and Space Science Workshop that was held at the University of Hartford and the Discovery Museum and Planetarium in August. The workshop was funded by the NASA CTSGC and was offered to K-12 teachers throughout the state, with a primary focus on teachers who work in the cities of Bridgeport and Hartford. Teachers were provided professional development on the newly adopted NGSS as well as ways to incorporate engineering design into their science curriculum. Some topics/activities included: Navigating and Implementing the NGSS, Differences Between Science and Engineering, How to Craft Engineering Design Lessons, Building and Testing a Dust Sensor, Parachuting Onto Mars, Keeping our Astronauts Healthy: The Science and Math of Dose Response Curves, among others.

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Space Grant Award Recipients (Fall 2016)

Faculty Research Grants

Brendan Cunningham (ECSU)
Andrea Kwaczala (U of Hartford)
Jillian Smith-Carpenter (Fairfield)
Bryan Weber (UCONN)

Faculty STEM Education Research and Programming Grants

Nancy DeJarnette (U of Bridgeport)
Alison Draper (Trinity)

Faculty Travel Grant

Amanda Harper-Leatherman (Fairfield)

Undergraduate Travel Grants

Lauren Atkinson (ECSU)
Jalal-ud-din Butt (CCSU)
Kimberly Colavito (U of Hartford)
Nina Kosciuszek (Fairfield)
Jeffrey Panko (UNH)
Avi Stein (Wesleyan)
Christina Welch (ECSU)

Graduate Research Fellowship

Tian McCann (UCONN)

Undergraduate Research Fellowships

Alec Andrulat (UNH)
Hannah Fritze (Wesleyan)
Anna Mercaldi (UNH)
Sophia Sanchez-Maes (Yale)
Dennis Scheglov (UCONN)

Student Project Grants

Lauren Atkinson (ECSU)
Kevin Bartlett (CCSU)
Joseph Dworkin (Trinity)
Christopher Gutierrez (Fairfield)
Evan Haas (Yale)
Julia McManus (Fairfield)
Jack Roth (Yale)
David Rutledge (CCSU)
Michael Van der Linden (Yale)

Undergraduate Scholarships

Dylan Bernard (CCSU)
Jalal-ud-din Butt (CCSU)
Daniel Cataldo (UCONN)
Kevin Connolly (ECSU)
Meagan Ferreira (UCONN)
Rami Hamati (Wesleyan)

Undergraduate Scholarships (cont.)

Ravina Hingorani (Fairfield)
Christopher Hollaway (CCSU)
Alicia Lynn (CCSU)
David Machado (Wesleyan)
Anthony Mastromarino (U of Hartford)
Samuel Nguyen (Fairfield)
Tristan Peirce (Trinity)
Kailey Pisko (ECSU)
Austin Thomas (UNH)
Christina Welch (ECSU)
Michael Wright (Fairfield)

Community College Scholarships

Josiel Batista (NVCC)
Elaina Becher (QVCC)
Lydia Gjuraj (NVCC)
Lindsey Japa (NVCC)
Jody Jarvella (NVCC)
Donato Piroscafo (Gateway)
Levi Reynolds (NVCC)
Andre Roscoe (NVCC)
Lanaya Shuler (NVCC)
William Perry Weingart (NCCC)

NASA CTSGC HQ

Program Director:
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Associate Director:
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Assistant Director:
Dr. Kenny Nienhusser

Program Coordinator:
Mrs. Janet Spatcher

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Tyler Cottrell
Adrienne Fisher
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Academic Affiliates

Asnuntuck Community College
Capital Community College
Central CT State University
Eastern CT State University
Fairfield University
Gateway Community College
Housatonic Community College
Manchester Community College
Middlesex Community College
Naugatuck Valley CC
Northwestern Connecticut CC
Norwalk Community College
Quinebaug Valley CC
Southern CT State University
Three Rivers CC
Trinity College
Tunxis Community College
University of Bridgeport
University of Connecticut
University of Hartford
University of New Haven
Wesleyan University
Yale University

Non-Academic Affiliates

CT Invention Convention
Connecticut Science Center
Discovery Museum
New England Air Museum

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CT Space Grant Lead Institution:

UNIVERSITY OF HARTFORD

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